Standards to Facilitate Portable Antenna Control Code for > 2 GHz Operation

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> 2 GHz Antenna System (>2GHzAS) Domain

- Signal processing code must address the > 2 GHz antenna system domain as described below
- >2GHzAS are generally used for
  - Beyond Line of Sight (BLOS) – SATCOM
  - High Capacity Line of Sight (HCLOS) - Terrestrial
  - >2GHzAS encompass significant functionality
    - Spatial, Spectral and Temporal processing
  - >2GHzAS frequency coverage
    - 6 GHz to 60 GHz for SATCOM, going to > 100 GHz, Lasercom
  - Plan for current and future missions and technologies
    - SATCOM-on-the-Move, HCLOS, Global information on demand
- Portable signal processing code standards for > 2GHz antenna systems must be compatible with and encapsulate the following functionality

Positioning **Control Code Standards**

Function	Description	Standard	Comments
Antenna Position	**Geo-location of antenna Lat. And Long.**	**GPS accuracy**	**Needed to determine vector to Satellite**
Elevation Control	**Elevation of main lobe boresight**	**0.1 degree resolution over > ½ hemisphere**	**Satellite acquisition and tracking**
Azimuth Control	**Azimuth of main lobe boresight**	**0.1 degree resolution over 360 degree Az.**	**Satellite acquisition and tracking**
Heading – IMU input	**Bore sight heading with respect to North**	**< 1 degree resolution**	**Mobile Applications**
Pitch - IMU input	**Change in Pitch**	**< 1 degree resolution**	**Mobile Applications**
Roll – IMU Input	**Change in Roll**	**< 1 degree resolution**	**Mobile Applications**
Elevation Limit	**Limits elevation to above “x” degrees**	**Programmable**	**Personnel Safety**

Level/Control **Code Standards**

Function	Description	Standard	Comments
Uplink Power Control	**Determines EIRP**	**0.25 dB resolution, 60 dB range**	**MIL-STD-188-164A**
Downlink Level Control	**Controls Rx Dynamic Range**	**0.25 dB resolution, 60 dB range**	**MIL-STD-188-164A**
Tx Blank/Inhibit	**Prevents radiation**	**60 dB attenuation minimum**	**Needed for TDMA, hopping systems**
Signal Strength	**Estimates Receive Signal Strength**	**0.50 dB resolution, 60 dB range**	**Input for Downlink control**
Handover	**Handover from one antenna to another in multi-antenna systems**	**Create criteria, protocol and control for handover**	**e.g. shipboard antennas subject to blockage**
Built-in-Test/Loopback	**Health monitoring**	**Set detection criteria, probability of false detection**	**Very high reliability required in most applications**

Spatial and Spectral Control Code Standards

Function	Description	Standard	Comments
Band Control	**C, X, Ku, Ka, Q-bands, millimeter wave**	**Band tune, band switch/time**	**Simultaneous multi-band control**
Beam Control	**Simultaneous beams, gain control, sidelobe suppression, beam steering**	**Number of beams, beamwidth, side-lobe gratings, beam steering time**	**Mainly for phased arrays**
Beam Nulling	**Null out interference**	**Depth of null (1dB resolution) agile null**	**Mainly for phased arrays**
Polarization Control	**Determines antenna polarization**	**RHCP, LHCP, Linear – Vert./Horiz.**	**Programmable polarization antennas**
Polarization Sense	**Automatic detection of polarization sense**	**RHCP, LHCP, Linear – Vert./Horiz.**	**Future Programmable polarization sense**
Co-site Mitigation	**Spatial, Spectral, Temporal mitigation**	**Programmable interference reduction**	**Increasing need for effective mitigation**
Anti-Jamming	**Spatial, Spectral, Temporal techniques**	**Programmable A/J protection**	**Increasing need for effective A/J**